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ABSTRACT

This paper discusses the development and implementation of graduate and undergraduate teacher education courses on microcomputers for secondary school teachers at the University of Akron (Ohio). Processes involved in developing courses for students using the Apple II microcomputer are described in the paper's first section. Decisions on the purchase of a microcomputer and programming are recounted, and recommendations are made on establishing microcomputer classes. In the second section, course descriptions, rationale statements, instructional objectives, materials, and requirements for undergraduate and graduate courses are described. Results of the 1982 spring and summer semester evaluations are presented in tabular format. Problems identified in the course presentations and evaluations are reviewed together with proposed resolutions. The first of three appendixes to this section outlines objectives and course topics for the undergraduate orientation course on microcomputer applications in the secondary school classroom. The second appendix provides a similar outline for the graduate course. Appendix C offers guidelines for the development of a program in BASIC for an Apple II microcomputer. A bibliography is included. The third section of the paper presents proposals which are currently underway for the revision of the courses. (JD)

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IMPLEMENTING COURSES IN MICROCOMPUTER APPLICATIONS IN THE SECONDARY SCHOOLS FOR THE UNDERGRADUATE AND GRADUATE LEVEL: PROBLEMS AND PROMISES

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Paper presented at the Conference on Teacher Education in the Computer Age at Ohio University in Athens on November 4, 1982.

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In reviewing the undergraduate and graduate courses entitled Minicomputer Applications, a brief account of the evolutionary process experienced in the development of the courses might be helpful to others who are embarking on a similar curriculum innovation. Presenting a course on microcomputer applications is a pioneer effort as noted by a graduate student. Problems did arise at various stages. Resolving problems is an ongoing process. Always there was promise.

The first section of this paper focuses on the initial idea of purchasing an Apple II system and the steps leading to the final development of course materials for microcomputer applications. Recommended steps are offered. The second section reviews the 1982 undergraduate and graduate course outlines, guidelines for the development of programs in BASIC, provisions for student use of Apple II, student evaluations, and the identification of problem areas. The third section will be distributed at the meeting and will address the proposals for revision of both the undergraduate and graduate courses to overcome the problems. The third section represents the greatest promise to achieve computer literacy in teacher education.

SECTION I

THE BEGINNING: APPLE II ACQUISITION, HOUSING, AND USE

Apple II Acquisition and Initial Housing and Use

On April 13, 1979, a colleague in the Elementary Department of Education joined me in requesting from the Dean of the College of Education an allocation of $1,000. for the purchase of a minicomputer to be housed in the College of Education. Both the Head of the Elementary Department and the Head of the Secondary Department supported our efforts. In the memo to the Dean we cited the potential of a minicomputer for the use of teacher education students in math and science. We also stated "Teachers can expect to have these minicomputers at their disposal before long." We requested the privelege of submitting specific information on the minicomputer which would best meet our needs after my return from the Boston meeting of the National Council of Teachers of Mathematics where I planned to survey computers on exhibit.

After consulting with the Head of the Department of Secondary Education and my colleague about the various microcomputers exhibited at the NCTM Meeting, I submitted a request to the Director of Project 419 on April 25, 1979 for the purchase of an Apple II System - 48 Ram with a Disk II Floppy Disk and Controller, Applesoft BASIC Firmware Card, Trendcom Printer with Controller, Video Modulator for Display, and a Tape Recorder as well as cassettes and diskettes. Also a Sony Color TV-19" screen plus a cart for housing were requested. The total request of $3,570.48 far exceeded the original request of $1,000. Again in this April 25th memo the use of the minicomputer was cited for the areas of math and science education.

The Apple II System, TV Monitor, and the cart were acquired in the fall of 1979. Assembly plus initial operation required an investment of time. Security of the Apple II System was a concern. At first the cart housing the entire system was stored in a small room across the hall from my office. For the courses Instructional Techniques in Math and in Science, my office served as a laboratory. The cart could be moved readily into my office for use by students or by me. Security to the storage room was provided by a special lock and restricted distribution of the keys. This security system did work.

The Apple II System was utilized in secondary science and math education. To gain a background in the BASIC language, I attended BASIC Programming Classes at the Basic Computer Shop in Fairlawn, Ohio in August 1979. With this experience with BASIC I could work with students in running published computer programs. Opportunity to run microcomputer programs in math on the Apple II System was provided for students enrolled in Instructional Techniques-Math in the fall of 1980 and 1981. One student who already had a command of a computer language wrote a short program in chemistry for Instructional Techniques-Science in 1980.

Proposal for the Undergraduate Course, Preparation of Course Materials, and Proposal for a Graduate Seminar

In the curriculum revision to meet the specifications of Project 419 Teacher Education Redesign, the one hour undergraduate course, Minicomputer Applications in the Secondary Classroom, was proposed as an elective. Students could schedule either the Minicomputer Applications course or the course, Career Options in Secondary Education. For the

clinical/diagnostic activities, a ten hour allocation of time was cited to write a program appropriate for the chosen certification area. Before structuring the course proposal, the research librarian in education conducted a literature search to identify microcomputer applications in the subject areas of business, English, modern language, math, science, and social studies. The literature background established was helpful in the development of the course of study and references were selected for inclusion in the bibliography. The course proposal was submitted in the October 12, 1979 Project 419 Undergraduate Curriculum Redesign Proposal for the Department of Secondary Education. Approval of the course followed. The course was scheduled as a senior level elective for Secondary Department undergraduates in the 1982 Spring Semester. A proposal submitted in 1979 to Project 419 for one hour load credit for released time to develop programs for the course was not funded.

In May 1981 the Director of the Computer Based Education Center and I submitted a Faculty Grant Proposal to develop programs in BASIC for the Apple II. The programs were for use in the new Minicomputer Application course. The proposal was funded. This grant covered the purchase of several disks, paper, and the services of a programmer to write the programs for records of attendance and records of student achievement and to assist the instructor of the course as needed in coding, debugging, and making changes in the various programs included in the course, Minicomputer Applications in the Secondary Classroom. Allocation of funds for faculty time to develop programs was excluded. The first programmer completed the programs on Record Keeping and Attendance during the summer of 1981.

In working with the Director of the Computer Based Education Center in 1981 I became aware of the incorrect use of minicomputer in the course title adopted in 1979. The Apple II is a microcomputer which uses a single-chip Central Processing Unit. The course did not utilize a minicomputer with the Central Processing Unit spread over several chips. Microcomputer will be used in the title of the revised course proposals.

During the summer of 1981 I proposed offering a graduate seminar for two semester hours on microcomputer applications in the secondary classrooms in the 1982 Spring Semester. The proposal was accepted by the Head of the Secondary Department and the seminar was scheduled.

In the fall of 1981 I began writing computer programs to demonstrate ways in which the computer could be applied in the secondary classroom. A background in programmed learning was helpful. Vocabulary Development Programs in Secondary Subject Areas, Programs for Apple II Microcomputer was written for the subject areas of English, Accounting, Biology, American History and Spanish with different instructional strategies and commands. These programs were developed with input from Secondary Department faculty members. I first developed an idea and then submitted the idea to the faculty member assigned Instructional Techniques. Approval was granted. After I developed the programs, each professor was invited to review the program as a user who knew all the answers and as a user who did not know all the answers. Several changes expanding answer options were offered and incorporated. During the writing of the computer programs it was most helpful to have the services of the computer programmer to debug programs and to offer programming commands to accommodate desired programming steps. It was also helpful

to have the programmer run printouts on the Computer Based Education Center printer for each of the programs which I developed. The Trencom printer became inoperable in the summer of 1981 and an Epson MX-80 F/T printer was attained in the summer of 1982.

Site For Classroom and Laboratory Use and Storage of the Apple II

Because the small room used to house the Apple II was needed as a Satellite Center for Media for the College of Education, a new location had to be established. After conferring with the Director of the Center for Economic Education and receiving his permission to house the Apple II, present the classes on Minicomputer Applications, and provide laboratory use of the Apple II in the Center, I requested permission from the Head of the Secondary Department to move the Apple II System in the fall of 1981 to the Center for Economic Education. The Center has long tables to accommodate workshops and has proved to be very satisfactory for course presentation as well as student and professor use of Apple II. However, there is a seating limitation.

Recommended Steps in Establishing Microcomputer Classes: A Promising Prescription

Before selecting a microcomputer, critically review the hardware features, availability of software, capability of graphics and color, plus audio quality. Explore opportunities to write grants to secure programming assistance and released time to write programs. Invite your colleagues to review your programs. Investigate the capability of a printer to handle graphics. Determine a secure area for class

presentation, laboratory use, and housing of the microcomputer. Identify personnel on campus who could assist you when the video or computer system breaks down. Review the literature and then write your course materials.

SECTION II

UNDERGRADUATE AND GRADUATE COURSE PRESENTATIONS AND EVALUATIONS

This section consists of three parts. The course descriptions, rationale statements, instructional objectives, materials, and requirements for both the undergraduate course and the graduate course are described in the first part. The results of the 1982 Spring Semester evaluations of the undergraduate and graduate courses and the 1982 Summer Session II evaluation of the graduate course are presented in the second part. Problems identified in the course presentations and evaluations are reviewed together with proposed resolutions in the third part.

Undergraduate and Graduate Course Presentations

The University of Akron General Bulletin describes 5300:445 Minicomputer Applications in Secondary Classrooms, the undergraduate course, as a one credit course offering 10 clinical hours with the prerequisites of the course, Principles of Teaching in the Secondary School, and senior status. The Bulletin describes the course as providing an orientation to the application of minicomputer in secondary classroom and states that a knowledge of BASIC programming is recommended. At the present time most students do not have a prior knowledge of Basic.

No similar description of the graduate course Seminar in Secondary Education: Minicomputer Applications in the Secondary Schools appears in the Bulletin because the course is one of several courses listed as 5300:780 Seminar in Secondary Education which offers an intensive examination of a particular area of secondary education. The graduate seminar is presented as a two semester hour course.

The course outlines for the undergraduate and graduate courses (See Appendices A and B) have similar rationale statements that computer literacy is an emerging goal in secondary education and that with the availability of low cost microcomputers, teachers will be able to utilize the microcomputer in the secondary classrooms for instruction, testing, and record keeping. The undergraduate rationale also states that the course is designed to help fulfill requirements of Ohio Law 419 on Teacher Education Redesign and Public Law 94-142 on mainstreaming.

Both the undergraduate and graduate courses have identical objectives at the knowledge level and skill level with one exception. The graduate course has an additional objective to assess the state of microcomputer use in the area of certification by reviewing an article describing either a specific program, the effective use of a specific program, or the potential for microcomputer use in a subject area. Course objectives classified at the knowledge level incorporate identification of parts of the computer, steps in writing a program, and commands. Course objectives classified as skills encompass the student's ability to develop a program and to assess commercially available programs and games. The course outline for both the undergraduate and graduate courses specifies the content included in the objectives.

The instructional materials were identical in both the undergraduate and graduate courses. The reference texts included the Beginning Applesoft ™ Basic and the Intermediate Applesoft ™ Basic volumes published by the Minnesota Educational Computing Consortium. In the graduate course more commands were covered in the Intermediate Applesoft ™ Basic than in the undergraduate course because of the added

one semester hour. A printout of Vocabulary Development Programs in Secondary Subject Areas was distributed as the textbook. A disk of these vocabulary programs was available for students to pursue the assignment of identifying the instructional strategy employed in each program and to evaluate as a user the specific commands such as Inverse, Flash, etc. The printouts were utilized to identify the use of specific commands and the sequential development of program statements. In the graduate course there was time to run the disks on Records of Attendance and Grade Book developed in the summer of 1981 by the programmer.

References in the course outlines included books, periodicals, dissertations, microform reproductions, and software programs available for student review. The graduate class in the 1982 Spring Semester had opportunity to review the Milliken program and in the 1982 Summer Session II had opportunity to review in addition the Minnesota Educational Computing Consortium disks in Business, Mathematics, Science, and Social Studies.

The undergraduate course required the writing of one program. The graduate course required the writing of two programs. The guidelines for the program development in BASIC were identical for the undergraduate and graduate class presentations. The guidelines consist of seven component parts: program identification; rationale for the computer program; program type; instructional strategy for the computer program; REM statements at the beginning of the computer program to identify program title, name of programmer, and the specific behavioral objectives of the computer program; preliminary written program; and the program on the disk (See Appendix C). In writing the program it is essential that the programmer

defines the subject area, grade level, the unit, and the topic. The rationale for using the computer program for instruction rather than another activity should also be identified. It is essential that the programmer before starting and during the writing keep in mind the program type: drill and practice, tutorial, simulation, problem solution, or test. Also the programmer should follow an appropriate instructional strategy: selecting a proper option, typing in the word or words of an answer, selecting an item which does not belong to a group, typing in a title which encompasses all of the cited parts, etc. A preliminary written program with 60 or more statements is required. Identification of ten different commands reviewed in class or appearing in the Vocabulary Development Programs in Secondary Subject Areas: Programs for Apple II Microcomputer is another requirement. Presentation of the program to the class affords opportunity for critical review by fellow classmates.

The titles of the programs in the undergraduate class ranged from "Passe Module-1" in French, "Understanding Recipes" in Home Economics, "Merchant Accountant" in Accounting, to "Solving Simple Equations" in Algebra 1. The titles of the programs in the graduate class ranged from "Behavioral Objectives" for teacher education classes, "Philosophy Terms" for a course in Introduction to Philosophy, "Area of the Parallelogram" for Arithmetic in middle school, to "Field Trips" a program obtaining information from teachers on proposed field trips to facilitate administrative action.

Evaluation of the Undergraduate and Graduate Courses

Participation in evaluation was voluntary and anonymous. The

instruments consisted of items utilizing a Likert-type scale and items requesting informational responses. Because of the similarity of course objectives, instructional materials, and instructional activities, the results of the undergraduate and graduate evaluations are reviewed together section by section with conclusions drawn from each section for the undergraduate course and for the graduate course. The two semester hour allocation of time for the graduate course permitted additional instructional activities and greater scope. In the 1982 Spring Semester the undergraduate course was offered to 17 students five of whom met with me separately after the fifth week of the semester because of enrollment in student teaching. In the graduate course there were nine students enrolled in the 1982 Spring Semester and nine students enrolled in Summer Session II.

Attainment of Specific Objectives

The first part of the instrument assessed the attainment of objectives cited in the course outline. A three point Likert Scale with 3 indicating Definitely (attained), 2 Somewhat Attained, and 1 Not Attained was employed. Attainment of the knowledge objectives relating to the identification of the parts of the Apple II computer; the steps in the development of the program; the procedures in loading, listing, saving, etc.; and certain BASIC commands was indicated by the median ratings which approached Definitely on the Likert scale with values ranging from 2.73 to 2.96 for the undergraduate evaluation and with values ranging from 2.92 to 3.00 in both graduate evaluations (See Table 1).

There was greater variance in the attainment of objectives classified as skills. However the objective relating to using the BASIC

language was attained by most students as indicated by the 2.79 median rating for the undergraduate evaluation and the 2.86 and 3.00 median ratings for the graduate evaluations. Attainment of the skill to develop a program for vocabulary development, for drill and practice, and for tests approached "Definitely" with median ratings ranging from 2.58 to 2.92 for the undergraduate evaluation and 2.25 to 3.00 for the graduate evaluations. The median ratings dropped for the skill objectives for developing a flow chart and then a program for problem-solving, developing a program to aid the exceptional student, developing a program for a record of attendance, and developing a program to record student achievement with median ratings ranging from 1.67 to 2.08 for the undergraduate evaluation. Time limitations prohibited development of these types of programs. The median ratings for the graduate evaluations were slightly higher (2.25 to 3.00) perhaps reflecting the opportunity to review the disk programs Record Keeping and Attendance. For the objective on assessing the commercially available programs the time limitations as well as the limitation of software were factors in the median ratings approaching Somewhat Attained with median ratings of 1.93 in the undergraduate evaluation and 2.13 in the graduate evaluation in the 1982 Spring Semester. The median value of 2.83 for the 1982 Summer Session II graduate evaluation reflects the addition of the four MECC disks in subject areas. The 1.86 and 1.50 median ratings which approach Somewhat Attained for the objective on assessing the merit of commercially available games indicate confusion over what constitutes a game. No microcomputer game was presented or reviewed.

For the two semester hour graduate course, the attainment of the

objective to assess the state of microcomputer use in the student's certification area was evaluated as definitely attained with 3.00 median values.

Semester Hour Allocation

For the remaining sections of the evaluative instrument, a three point Likert Scale was employed with 3 for Yes, 2 for Somewhat, and 1 for No. For the question on adequacy of the one semester hour allocation for the undergraduate course, the response was negative with a median value of 1.12. For the two semester hour graduate course the median rating for the 1982 Spring Semester (1.14) indicated inadequacy and the median rating for the 1982 Summer Session II (1.83) indicated adequacy described as somewhat. More semester hour time allocation is needed for both the undergraduate and graduate course offerings.

Texts

For the undergraduate and graduate offerings the same text materials were used. The text references, Beginning Applesoft Basic and Intermediate Applesoft Basic were rated helpful in attaining the course objectives with median ratings ranging from 2.67 to 3.00. The text Vocabulary Development Programs in Secondary Subject Areas: Programs for Apple II Microcomputers, was rated as helpful in presenting examples of microcomputer programs with median ratings ranging from 2.83 to 3.00. The instructional materials were rated as helpful for the undergraduate and graduate courses.

Method of Course Presentation

Similar methods were employed for the undergraduate and graduate courses. The poster display of commands, explanations, and short programs was evaluated by the undergraduates (2.28) as somewhat helpful and by the

graduates (2.94 and 3.00) as helpful. Classroom participation in entering the short programs at the terminals was rated helpful by both the undergraduate (2.85) and the graduates (2.75 and 3.00). The classroom sharing of the one computer program project in the undergraduate course and the two computer program projects in the graduate courses were rated helpful with median ratings ranging from 2.79 to 3.00.

In the graduate course the classroom sharing of the literature reviews about the use of the microcomputers in various fields was rated as helpful with median ratings of 2.75 and 2.83. The guidelines for selecting commercially available software were rated as helpful in gaining perspective with median ratings of 2.60 and 2.75.

Project of Program Development

In both the undergraduate and graduate courses, guidelines for the project of computer program development were distributed. These guidelines were rated as helpful by both the undergraduate evaluation (2.89) and by the graduate evaluation (2.93 and 3.00). The undergraduates rated the one required program in BASIC as helpful to them in writing additional programs with a median rating of 2.97. The median number of hours spent in the one program development was 15.2 hours with a range from 3 to 30 hours. Review of the listing of 10 clinical hours for the undergraduate course will be undertaken in the new course proposal.

The graduate students rated the two required programs in BASIC as helpful to them in writing additional programs with a median rating of 3.00. The median number of hours spent in the first program development was 21.1 hours with a range from 8 to 40 hours. The median number of hours spent in the second program development was 15.1 hours with a range from 4 to

to 20 hours.

Laboratory Hours on the Apple II

The laboratory hours on the Apple II were scheduled for the first half of the semester to accommodate one hour practice time per week in the 1982 Spring Semester and one hour per day for the first half of the 1982 Summer Session II. This practice time was rated as somewhat adequate for the undergraduates (2.17) and not adequate for the graduates (1.08 and 1.25). For the second half of the 1982 Spring Semester the practice time was increased to two hours per week which was rated as somewhat adequate by the undergraduates (1.90) and adequate by the graduates (2.80). For the second half of 1982 Summer Session II, the two hours per day laboratory time was rated as adequate in the graduate evaluation (3.00).

The five student teachers who were off-campus in the schools of assignment after the first five weeks indicated that there was a problem of being on campus for laboratory hours (Yes 100%).

Because of private ownership of microcomputers, opportunity to use an Apple II at the Wayne General and Technical College of The University of Akron, and secondary school loans to teachers during the summer, one undergraduate and four graduate students during the 1982 Spring Semester and four graduate students during the 1982 Summer Session II had no need of the Apple II laboratory time.

Classroom Facilities

The Apple II System in the cart was housed in the Center for Economic Education where classes were conducted and laboratory or Apple II practice time was scheduled. This location for classroom instruction was

rated as appropriate by the undergraduates (2.73) and the graduates (2.94 and 2.93). The rating of the Center for Economic Education as being appropriate for practice time on the Apple II ranged from somewhat (2.00) for the 1982 Spring Semester graduate students to appropriate (3.00) for the 1982 Summer Session II graduate students.

Microcomputer Experience

The enjoyment of working with the Apple II was evidenced by the median ratings of the undergraduates (2.93) and of the graduates (3.00). Prior knowledge of a computer language was indicated by 6 undergraduates (35.3%) and by 3 graduate students (33.3%) in the 1982 Spring Semester and by 2 graduate students in the 1982 Summer Session II. A number of different languages were identified.

Support for a requirement for the undergraduate course, Minicomputer Applications in the Secondary Classrooms, in the teacher education program was indicated by 64.7% of the undergraduates and 87.5% of the graduate students.

Comments

Comments were offered but there was no central tendency.

Problems Identified in Course Presentations and Evaluations

From the evaluations problems of inadequate time to address all of the course objectives and inadequate opportunity for student laboratory use of Apple II were identified. Student teachers did have problems with the laboratory use of the Apple II on campus.

Some problems were not identified by the evaluations. Graphics and the use of color in program development were introduced but not

developed because of the time limitations of the courses. Graduate and undergraduate students who have completed the respective course in Minicomputer Applications are asking about additional courses. There has been the problem of breakdown of the system. In the 1982 Spring Semester there was a "down" time of three days required during the repair of the one disk drive. The problem of one undergraduate student who entered with a fair command of the BASIC language was resolved by meeting separately with the student for additional program development until the class schedule of sharing programs.

New course proposals are being submitted which will accommodate more course time and opportunity to pursue the use of graphics, color, and the Apple Writer II. The Apple Writer II has been requested for acquisition together with the Language Card for Pascal II. Independent Study or a future course proposal may be developed for Pascal II.

The limitation of available laboratory time has been alleviated partially by extending Apple II practice hours from 8:00 A.M. to 8:00 P.M. during the 1982 Fall Semester. A second Apple II has been requested for acquisition but whether it will accommodate both student use and anticipated use by the Secondary Department faculty will have to be determined. The second Apple II will solve the problem of complete "down" time. The second disk drive which was acquired in 1982 August enabled class and laboratory use of the Apple II when there was disk drive failure in the 1982 Fall Semester undergraduate course presentations.

Problems have been encountered and some, but not all, of these problems have been resolved. Hopefully, the new course proposals for the undergraduate and graduate presentations will represent the greatest

promise for achieving the goal, computer literacy in teacher education.

TABLE 1

THE 1982 SPRING EVALUATIONS OF THE COURSES MINICOMPUTER APPLICATIONS IN SECONDARY CLASSROOMS (UNDERGRADUATE) AND MINICOMPUTER APPLICATIONS IN THE SECONDARY SCHOOLS (GRADUATE AND POST-BACCALAUREATE) AND THE S.S.II EVALUATION OF THE MINICOMPUTER APPLICATIONS IN THE SECONDARY SCHOOLS (GRADUATE AND POST-BACCALAUREATE)

Submitted by Dr. Joy S. Lindbeck

For Section A, ratings were based on a three point Likert Scale: 3 Definitely, 2 Somewhat Attained, and 1 Not Attained.

		SPRING				SUMMER SESSION II	
A.	Attainment of Specific Objectives	Undergraduate 1 Sem. Hr.		Grad. & Post-Bac. 2 Sem. Hrs.		Grad. & Post Bac. 2 Sem. Hrs.	
		N	Median	N	Median	N	Median
	Knowledge						
	1. Identify the parts of an Apple II Microcomputer and the function of the parts including printer & disks	17	2.73	9	3.00	8	2.92
	2. List the steps in the development of the program	17	2.85	9	3.00	8	2.92
	3. For program development describe procedures for leading, listing, saving, editing, cataloging, deleting, locking and unlocking	15	2.96	7	2.92	8	2.92
	4. For program development, describe the basic commands: print, mathematical symbols, input, input with string, goto, if...then, counting right and wrong responses	17	2.79	8	2.93	4	3.00

TABLE 1 Continued

Skills	SPRING				SUMMER SESSION II	
	Undergraduate 1 Sem. Hr.		Grad. & Post-Bac. 2 Sem. Hrs.		Grad. & Post Bac. 2 Sem. Hrs.	
	N	Median	N	Median	N	Median
1. Use the BASIC Language in program development	17	2.79	9	2.86	8	3.00
2. Selection of several of the following according to interest (one selection must be a program development)	5	2.67	4	3.00	5	3.00
a. Develop a program for vocabulary development	16	2.61	8	2.93	5	3.00
b. Develop a program for drill and/or practice	14	2.92	9	2.86	7	3.00
c. Develop a program for test presentation	11	2.58	7	2.25	6	2.90
d. Develop a flowchart and then a program for problem-solving	11	1.67	6	2.75	5	2.25
e. Develop a program to aid the exceptional student	11	1.92	6	2.25	4	2.50
f. Develop a program for a record of attendance	11	1.67	7	2.00	5	2.88
g. Develop a program to record student achievement	10	1.83	5	2.00	6	2.90
1) Test Scores	9	2.00	7	2.00	5	3.00
2) Homework Credit	9	2.08	7	2.00	4	3.00
3) Project Credit	9	1.88	7	2.00	4	3.00
4) Laboratory Credit			7	2.25	4	3.00
5) Accumulative Scores	8	2.00	7	2.00	4	3.00
h. Assess commercially available programs	12	1.93	7	2.13	8	2.83
i. Assess the merit of commercially available games	11	1.86	6	1.50	4	1.50

TABLE 1 Continued

	SPRING				SUMMER SESSION II	
	Undergraduate 1 Sem. Hr.		Grad. & Post-Bac. 2 Sem. Hrs.		Grad. & Post-Bac. 2 Sem. Hrs.	
	N	Median	N	Median	N	Median
j. Assess the state of microcomputer use in your certification area by reviewing an article which describes either a specific program or the potential for microcomputer use in a subject area	--	--	9	3.00	6	3.00
For all other sections ratings were based on a three point Likert Scale: 3--Yes; 2--Somewhat; 1--No						
B. Semester Hour Allocation						
1. To attain these objectives, do you feel that a, one semester hour course is adequate?	16	1.12	--	--	--	--
2. To attain these objectives, do you feel that a two semester hour course is adequate?	--	--	9	1.14	8	1.83
C. Texts						
1. Was the Beginning Applesoft Basic reference textbook helpful to you in attaining the objectives?	17	2.79	9	3.00	8	3.00
2. Was the Intermediate Applesoft Basic reference textbook helpful to you in attaining the objectives?	15	2.67	8	2.83	8	3.00
3. Was the Vocabulary Development Programs in Secondary Subject Areas: Programs for Apple II Microcomputers (the disks and handout) helpful to you in presenting examples of minicomputer programs?	16	2.83	9	2.94	8	3.00

TABLE 1 Continued

	SPRING				SUMMER SESSION II	
	Undergraduate 1 Sem. Hr.		Grad. & Post-Bac. 2 Sem. Hrs.		Grad. & Post-Bac. 2 Sem. Hrs.	
	N	Median	N	Median	N	Median
D. Method of Course Presentation						
1. Was the poster display of explanation and commands helpful to you in attaining a working knowledge of basic?	17	2.28	9	2.94	8	3.00
2. Was the classroom participation in entering the short programs at the terminal helpful to you in attaining a working knowledge of basic?	17	2.85	9	2.75	8	3.00
3. Was the classroom sharing of your project programs helpful to you in attaining an understanding of the applications of minicomputers in the secondary classroom?	17	2.79	--	--		
3. Was the classroom sharing of your two project programs helpful to you in attaining an understanding of the applications of minicomputers at the secondary or higher education level?	--	--	9	3.00	8	3.00
4. Was the classroom sharing of the literature reviews about the use of minicomputers in the various fields helpful to you in gaining perspective?	--	--	9	2.75	8	2.83
5. Were the guidelines for selecting commercially available software helpful to you in gaining perspective?	--	--	9	2.60	8	2.75

TABLE 1 Continued

	SPRING				SUMMER SESSION II	
	Undergraduate 1 Sem. Hr.		Grad. & Post-Bac. 2 Sem. Hrs.		Grad. & Post-Bac. 2 Sem. Hrs.	
	N	Median	N	Median	N	Median
E. Project of Program Development						
1. Was the set of guidelines helpful to you in developing your project programs?	17	2.89	9	2.93	8	3.00
2. Do you judge that this project will be helpful to you in writing additional programs in basic for the Apple II?	17	2.97	--	--	--	--
3. How many hours did you spend in the program development?	10	15.2 Hrs. Mean RANGE 3 - 30 HRS.	--	--	--	--
2. Do you judge that these two programs will be helpful to you in writing additional programs in basic for the Apple II?	--	--	9	3.00	8	3.00
3. How many hours did you spend in writing? the first program			9	21.1 Hrs. Mean RANGE 8 - 40 HRS.	8	21.5 Hrs. Mean RANGE 6 - 50 HRS.
The second program	--	--	9	15.1 Hrs. Mean RANGE 8 - 30 HRS.	8	15.0 Hrs. Mean RANGE 4 - 20 HRS.
F. Laboratory Hours on the Apple II						
1. Was the one-hour per week time from January until Spring Recess adequate for your practicing the various commands?	16	2.17	7	1.08	3	1.25
2. Was the two hour per week time at the Apple II from Spring Recess until the end of the Spring Semester adequate for your program development?	16	1.90	7	2.80	1	3.00

TABLE 1 Continued

	SPRING				SUMMER SESSION II	
	Undergraduate 1 Sem. Hr.		Grad. & Post-Bac. 2 Sem. Hrs.		Grad. & Post-Bac. 2 Sem. Hrs.	
	N	Median	N	Median	N	Median
F. Laboratory Hours on the Apple II Cont'd.						
3. If you completed Student Teaching in the Spring Semester 1982, was there a problem of being on campus for your Apple hours?	5	--	--	--	--	--
	YES 100%					
4. Did you have no need of Apple use time in Zook 134 because of access to another Apple?	17	--	8	--	7	--
	1 YES 6%		4 YES 50%		3 YES 42.9%	
	15 NO 94%		4 NO 50%		4 NO 57.1%	
G. Classroom Facilities						
1. Did you find Zook 434, Center for Economic Education, appropriate for classroom instruction?	17	2.73	9	2.94	8	2.93
2. Did you find Zook 434, Center for Economic Education, appropriate for practice time on Apple II?	16	2.61	6	2.00	6	3.00
H. Minicomputer Experience						
1. Did you enjoy your work with the Apple?	17	2.93	9	3.00	8	3.00
2. Did you have any prior knowledge of a computer language?	17		--	--		
	6 YES 35.3%					
	11 NO 64.7%					
Information Data Processing - 1 Cobol - 1						
Some Fortran - 1 Fortran - 1						
Not sure what language - 1 Basic - 1						
2. Did you have any prior knowledge of a computer language	--	--	9	--	8	--
			3 YES	33.3%	2 YES	25%
			6 NO	66.7%	6 NO	75%
	Basic - 2		GPSS - 1		Basic - 1	
	Platal - 1		SPSS - 1			
	Machine Language - 1		COBOL- 1			
			RPG II - 2			

TABLE 1 Continued

	SPRING				SUMMER SESSION II	
	Undergraduate 1 Sem. Hr.		Grad. & Post-Bac. 2 Sem. Hrs.		Grad. & Post-Bac. 2 Sem. Hrs.	
	N	Median	N	Median	N	Median
H. Minicomputer Experience Cont'd.						
3. Do you think that this course, Minicomputer Applications in the Secondary Classroom should be required in our teacher certification program?	17	--	--	--		
	11 YES	64.7%				
	6 NO	35.3%				
3. Would you favor implementing a requirement for the undergraduate course Minicomputer Applications in the Secondary Classrooms, in our teacher education program?			8	--	8	--
			7 YES	87.5%	7 YES	87.5%
			1 NO	12.5%	1 NO	12.5%

COMMENTS WITH FREQUENCY INDICATED

Spring Undergraduate (N=17)

More time should be allowed	N=7
Expand to 2-3 semester hours	N=2
More computers should be available	N=5
Class should not be taken during student teaching	N=1
A good class	N=4
Need to work in an area/room where we won't distract people and people won't distract us	N=1
Most people have a radio shack	N=1
Only in the future should the course be required	N=1
Instead of a required course, have a few workshops	N=1
Requirements of a course should be according to certification area	N=1
Assign projects at the beginning	N=1
Poster approach took time	N=1

Spring Graduate (N=9)

Excellent course, require course for all prospective teachers	N=2
Need more than one Apple	N=2
Should have more than 2 semester hour credit	N=1
Positive comment on amount covered in course and enjoyment	N=2
Wished we could have gotten into graphics and more advanced programming	N=1
Because of time for (student) putting programming on the computer, did not cover as much material	N=1
No one will escape microcomputers-reference to the reading list book, The Micro Millenium	

Summer Session II Graduate (N=8)

Excellent, helpful or informative	N=3
Enjoyable	N=3
This course should be mandatory	N=1
University should offer more classes in computer applications	N=1
Your approach was very tension-free	N=1

APPENDIX A

MINICOMPUTER APPLICATIONS IN SECONDARY CLASSROOMS
5300:445
1 Credit

PREREQUISITES

5300:310 and Senior Status

CATALOGUE DESCRIPTION

This course will provide an orientation to the applications of the minicomputer in secondary classrooms.

RATIONALE

This course is designed to help fulfill requirements of Ohio Law #419 on Teacher Education Redesign and Public Law 94-142 on mainstreaming.

Computer literacy is an emerging goal in secondary education. With the availability of low cost minicomputers, teachers will be able to utilize the minicomputer in secondary classrooms for instruction, testing and record keeping.

SPECIFIC OBJECTIVES

A. Knowledge
   1. Identify the parts of an Apple II microcomputer and the functions of the parts including printer, cassette, and discs.
   2. List the steps in the development of a program.
   3. For program development, describe procedures for loading, listing, saving, editing, cataloging, deleting, locking and unlocking.
   4. For program development, describe the basic commands: print, mathematical symbols, input, input with string, goto, if. . . then, counting right and wrong responses, etc.

B. Skills
   1. Use the basic language in program development.
   2. Selection of several of the following according to interest (one selection must be a program development).
      a. Develop a program for bocabulary development
      b. Develop a program for drill and/or practice
      c. Develop a program for test presentation
      d. Develop a flowchart and then a program for problem-solving
      e. Develop a program to aid the exceptional student
      f. Develop a program for a record of attendance
      g. Develop a program for student achievement
         1) Test Scores
         2) Homework Credit
         3) Project Credit
         4) Accumulative Scores

h. Assess commercially available programs
i. Assess the merit of commercially available games

COURSE OUTLINE

A. Parts of the microcomputer
B. Steps in the program development
C. Program development use of various commands:
   1. Load
   2. List
   3. Run
   4. Save
   5. Catalog
   6. Delete
   7. Lock
   8. Unlock
   9. Print
   10. VTAB
   11. HTAB
   12. ZZ$
   13. Input
   14. Input with strings
   15. Goto
   16. If. . .then
   17. (Counting right and wrong responses)
   18. (Using mathematical skills)
   19. Other Commands useful in program development
D. Programs for vocabulary development
E. Programs for drill and/or practice
F. Program for problem-solving
   1. Flow charts
   2. Programs
G. Programs for testing
H. Programs for the exceptional student
I. Use of color for reenforcement
J. Program for records of attendance
K. Program for records of students achievement
   1. Test Scires
   2. Homework Credit
   3. Project Credit
   4. Laboratory Credit
   5. Accumulative Scores
L. Criteria for selection of commercially available programs
M. Games
   1. Criteria for selection
   2. Instructional Use
N. Computer literacy

Reference Texts:

Minnesota Educational Computing Consortium. Beginning Applesort™ (Preliminary Version for Use with the Applr™ II Microcomputer) St. Paul, Minnesota: Minnesota Educational Computing Consortium, 1980. TEXT

Minnesota Educational Computing Consortium. Intermediate Applesoft™ Basic (Preliminary Version for Use With the Apple ™ Microcomputer) St. Paul, Minnesota: Minnesota Educational Computing Conscrtium, 1981.

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Commercial Programs on Disks

*Business	Volume 1	MECC Publication
*Mathematics	Volume 3 (Geometry)	MECC Publication
*Science	Volume 2 (High School)	MECC Publication
*Social Studies	Volume 1	MECC Publication

MECC = Minnesota Educational Computing Consortium: St. Paul, Minnesota

* Available on the shelf of the Apple Cart.

Math Sequences: Computer-Based Courseware for Grades 1 - 6 — Milliken

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APPENDIX B

MINICOMPUTER APPLICATIONS IN THE SECONDARY SCHOOLS

5300:780 Graduate
5300:480 Post-Baccalaureate
2 Credits

CATALOG DESCRIPTION

This course will provide an orientation to the application of the microcomputer in the secondary schools.

RATIONALE

Computer literacy is an emerging goal in secondary education. With the availability of low cost microcomputers, teachers will be able to utilize the microcomputer in the secondary classrooms for instruction, testing, and record keeping.

SPECIFIC OBJECTIVES

A. Knowledge
   1. Identify the parts of an Apple II microcomputer and the functions of the parts including printer, cassette, and discs.
   2. List the steps in the development of a program
   3. For program development describe procedures for loading, listing, saving, editing, cataloging, deleting, locking and unlocking.
   4. For program development, describe the basic commands: print, mathematical symbols, input with string, goto, if. . .then, counting right and wrong responses, etc.

B. Skills
   1. Use the basic language in program development
   2. Selection of several of the following according to interest (one selection must be a program development)
      a. Develop a program for vacabulary development
      b. Develop a program for drill and/or practice
      c. Develop a program for test presentation
      d. Develop a flowchart and then a program for problem-solving
      e. Develop a program to aid the exceptional student
      f. Develop a program for a record attendance
      g. Develop a program for student achievement
         1) Test Scores
         2) Homework Credit
         3) Project Credit
         4) Laboratory Credit
         5) Accumulative Scores
      h. Assess commercially available programs
      i. Assess the merit of commercially available games

j. Assess the state of microcomputer use in your certification area by reviewing an article which describes either a specific program, the effective use of a specific program or the potential for microcomputer use in a subject area.

COURSE OUTLINE

A. Parts of the microcomputer
B. Steps in program development
C. Program development use of various commands:
   1. Load
   2. List
   3. Run
   4. Save
   5. Catalog
   6. Delete
   7. Lock
   8. Unlock
   9. Print
   10. VTAB
   11. HTAB
   12. ZZ$
   13. Input
   14. Input with strings
   15. Goto
   16. If. . .then
   17. (Counting right and wrong responses)
   18. (Using mathematical skills)
   19. Other commands useful in program development
D. Programs for vocabulary development
E. Programs for dill and/or practice
F. Program for problem-solving
   1. Flow charts
   2. Programs
G. Programs for testing
H. Programs for the exceptional student
I. Use of color for reenforcement
J. Program for records of attendance
K. Program for records of student achievement
   1. Test Scores
   2. Homework Credit
   3. Project Credit
   4. Laboratory Credit
   5. Accumulative Scores
L. Criteria for selection of commercially available programs
M. Games
   1. Criteria for selection
   2. Instructional use
N. Computer Literacy

FOR THE LISTING OF TEXTBOOKS AND BIBLIOGRAPHY SEE THE COURSE OUTLINE FOR MINICOMPUTER APPLICATIONS IN THE SECONDARY CLASSROOMS

APPENDIX C

GUIDELINES FOR THE DEVELOPMENT OF A PROGRAM IN BASIC FOR AN APPLE II MICRO-COMPUTER FOR A SECONDARY SUBJECT AREA

Due Date: Monday, Nov. 22 for Monday 6:00 p.m. class (5300:445/080)
Thursday, Dec. 2 for Thursday 9:00 a.m. class (5300:445/001)

The complete program will consist of six component parts:

*1. Program Identification
*2. Rationale for the Computer Program
*3. Program Type (Drill & Practice, Tutorial, Simulation, Problem-Solution, or Test)
*4. Instructional Strategy for the Computer Program
*5. REM statements at the beginning of the computer program to to identify program title, name of programmer, and specific behavioral objectives of the computer program
*6. Preliminary written program
**7. Program on disk

* Presented on paper
** Presented on disk

1. PROGRAM IDENTIFICATION

On a sheet of paper present the following information according to the format shown:

Subject Area_____ Programmer_____

Grade Level _____ Title of Program _____

Unit _____

Topic _____

RATIONALE

State the underlying reason for utilizing a computer program for instruction rather than a text assignment for reading, responding to chapter questions, or solving chapter problems; or a worksheet; or some other classroom, laboratory, or resource center (library) activity.

2. PROGRAM TYPE

Indicate the type of program: drill and practice, tutorial, simulation, problem solution, or test.

3. INSTRUCTIONAL STRATEGY FOR THE COMPUTER PROGRAM

Describe the instructional strategy in the computer program in a presentation similar to the classroom review of the instructional strategy employed in each program in Vocabulary Development Programs in Secondary Subject Areas: Programs for Apple II Microcomputer.

4. SPECIFIC BEHAVIORAL OBJECTIVES

At the beginning of your computer program in basic, use REM statements to identify program title, name of programmer, and specific behavioral objectives which would be achieved by the computer program.

5. PRELIMINARY WRITTEN PROGRAM

The computer program may be written for tutorial drill and practice, problem solution, or test presentation. The program should consist of a minimum of 80 statements. Because the PRINT statements are generally numbered 10, 20, 30, 40, etc., the program which begins with 10 should have a final print statement number of 800 or higher.

Ten basic commands presented in class either in the poster chart programs or in the programs presented in Vocabulary Development Programs in Secondary Subject Areas: Programs for Apple II Microcomputer should be used in the program development. The ten basic commands may be selected from the following:

PRINT (for spacing)
INPUT
IF THEN
IF GO
GET ZZ$
TAB
VTAB
HTAB
HOME
GOTO or GO TO
PRINT "--------"
IF THEN GO
INVERSE
FLASH
NORMAL
READ and DATA
Variables (A1, AS, P, N$)
LET followed by PRINT
PRINT , , (recording information in three columns)
PRINT, (recording information in two columns)
Math commands (+, -, *, /, and ^)
Operational order of execution (parentheses, exponent, multiplication and division)
Use of relational operators (equal to =,less than < , greater than > , not equal to <> , greater than or equal to >=, less than or or equal to <=.
Counter (LETR=0, LETW=0)
Loops (IF THEN; LET IF THEN; FOR NEXT; FOR NEXT with user INPUT N; FOR NEXT and STEP)

6. PROGRAM AND DISK

Note that the REM statements should appear first followed by the computer program.

A printout of the listed program should accompany the disk. On the printout a red pencil or red ink should be used to underline the ten commands utilized and to indicate the positive reenforcement statements.

Beginning on Monday, November 22 for the 6:00 pm class and on Thursday, December 2 for the Thursday 9:00 am class, each program will be demonstrated to the class with a user selecting all correct responses and a user selecting all incorrect responses.

7. EVALUATION

The program project will be evaluated on the bases of rationale, type of program, instructional strategy, specific behavioral objectives, and the computer program plus the program identification, the preliminary written program, and the classroom presentation.

The computer program will be evaluated on appropriate use of commands (a minimum of ten commands is required), spacing (no words should be split on the screen presentation and spacing between statements should be adequate for reading), length, achievement of objectives, appropriate reenforcement, etc.

SECTION III

PROPOSALS FOR THE REVISION OF THE UNDERGRADUATE AND GRADUATE COURSES

Microcomputer Literacy for Secondary Teaching
(Undergraduate Course Proposal)

Advanced Microcomputer Applications in the Secondary Schools
(Graduate Course Proposal)

NOTE: Section III Proposals for the Revision of the Undergraduate and Graduate Courses is the last section of the paper "Implementing Courses in Microcomputer Applications in the Secondary Schools for the Undergraduate and Graduate Level: Problems and Promises." These proposals are currently under consideration by the Secondary Department of Education at The University of Akron

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COURSE TITLE: MICROCOMPUTER LITERACY FOR SECONDARY TEACHING

COURSE NUMBER: 5300:

CREDIT HOURS: Three semester hours (30 clinical hours)

CATALOGUE DESCRIPTION: Prerequisites: 310 and senior status. Provides an orientation to applications of various modes of instruction, word processor, color, graphics, and printer in BASIC programs appropriate for secondary classrooms.

I RATIONALE

Teachers in secondary classrooms must be skilled in using microcomputers assessing software and hardware, writing programs in BASIC, and assessing the potential and limitations of microcomputers. In order to achieve these skills they must become familiar with the major components of a microcomputer system and with its operation through hands-on use in executing commercially available programs and in writing programs. They also need to assess the most effective modes of instruction for application of the microcomputer in the secondary classroom

II GENERAL OBJECTIVES

The student will

A. achieve computer literacy as required by a secondary teacher in today's classroom

B. understand the potential, limitations, and problems of microcomputers in the secondary classroom

C. demonstrate competency in writing programs in BASIC appropriate for a secondary subject area

D. evaluate hardware and software to facilitate good decision-making prior to acquisition.

E. appreciate the career opportunities in computer technology and the future of electronic technology.

SPECIFIC OBJECTIVES

A. Knowledge

By the end of the course, the student will be able to:

1. identify and describe procedures, statements, functions, and commands in writing programs in BASIC for the secondary classroom.
2. discuss computer literacy in the secondary classroom and the advantages of using microcomputer programs as opposed to using textbook activities, handouts, and laboratory programs.
3. identify and describe the development, limitations, potential, security, care and housing of the microcomputer for secondary student use.
4. describe evaluative criteria useful in decision-making in the selection of a microcomputer, peripherals, and software for secondary student use.
5. list resources which would be helpful to the secondary teacher in planning for instructional computing.
6. discuss salient research findings about the achievement levels, retention, attitudes toward learning, etc., with computer-assisted instruction at the secondary level.
7. cite careers in computer technology.
8. discuss the social, economic, and legal impact of computers as well as the projected futures of electronic technology.

B. Skills

By the end of the course, the student will be able to:

1. analyze a program written in BASIC appropriate for a secondary classroom and identify the instructional mode, strategy, and use of BASIC statements, functions, and commands.
2. develop two different programs in BASIC appropriate for the secondary classroom with the use of color in one program.
3. operate the printer.
4. demonstrate a classroom use of the word processor (Apple Writer II and Sens Speller).

Skills, Continued.

5. assess a commercially available program appropriate for secondary classroom use.

6. assess microcomputers and peripherals for secondary classroom use.

C. Attitudes and Values

By the end of the course, the student will be able to:

1. display an enjoyment of the teaching activity involving microcomputers.

2. be sensitive to the moral and value problems posed by massive computer dependency.

III COURSE OUTLINE

A. Computer Literacy
   1. Knowledge of what a computer is
   2. Knowledge of how computers are used
   3. Knowledge of the limitations of computer programs
   4. Knowledge of the social, economic, and psychological impact of the computer in society
   5. Knowledge about programming language
   6. Knowledge of programming in a language

B. History of the Computer
   1. Abacus 3000 BC
   2. Blaise Pascal 1642
   3. Jacquard 1800
   4. Babbage 1822 ("Father of Computers")
   5. Hollerith 1890
   6. Automatic Sequence Controlled Calculator (Mark!) - first general purpose computer 1944
   7. Electronic Numerical Integrator and Calculator (ENIAC) - first electronics digital computer 1946
   8. Second Generation (Transistors) 1958-63
   9. Third Generation (Integrated Circuits) 1964-70
   10. Fourth Generation (Microchip) 1970

C. Microcomputer Operation
   1. Component Parts
      a. Byte
      b. Cathode Ray Tube (CRT)
      c. Central Processing Unit (CPU)
      d. Controller Card
      e. Disk Drive
      f. Diskettes or Disks
      g. Display Screen
      h. Floppy Disks
      i. Hardware
      j. Integrated Circuits (Chips)
      k. Memory
      l. Peripherals
      m. Power Lamp
      n. Power Supply
      o. Random - Access Memory (RAM)
      p. Software
      q. Terminal
      r. TV Monitor Connection

   2. Operation of the System
      a. Disk Operating System (DOS)
      b. Booting DOS Version
      c. Use of System Master Diskette
      d. Initializing a disk

3. Care of the Microcomputer System
   a. Diskettes
   b. Terminal
   c. Disk Drive
   d. Printer

4. Limitations of Computers and Microcomputer Systems

D. Computer Languages - Advantages and Limitations in Applications in the Secondary Classrooms
   1. Beginners All-Purpose Symbolic Instruction Code (BASIC)
   2. Common Business Oriented Language (COBOL) - business
   3. Formula Translator (FORTRAN)
   4. LOGO (for children)
   5. PASCAL

E. Use of Microcomputers in Secondary Classrooms
   1. Instruction
      a. Writing with aid of word processor (Apple Writer II and Sens Speller)
      b. Secondary subject areas
      c. Special Education - Individualized Education Plan
      d. Vocational education
      e. Teacher record keeping
      f. Test administration and scoring

   2. Secondary Administration Uses

   3. Housing
      a. Security
      b. Distribution
         (1) One class - one microcomputer
         (2) Rotating use of one microcomputer
         (3) Laboratory facility
             (a) Directed individual activity
             (b) Free access

   4. Program Types
      a. Computer managed instruction
      b. Drill and practice
      c. Tutorial
      d. Simulations
      e. Instructional games
      f. Problem solving
      g. Evaluation and test item banking
      h. Record Keeping and processing
         (1) Test scores
         (2) Homework credit
         (3) Project credit
         (4) Laboratory credit
         (5) Accumulative scores
      i. Programs for the exceptional student

5. Advantages of Microcomputers in Secondary Classrooms
   a. Relevant education
   b. Increased motivation
   c. Immediate feedback
   d. Individualized instruction
   e. Releasing teachers from drill work
   f. With word processor (Apple Writer II and Sens Speller) the improvement of writing skills
   g. Simulations impossible to duplicate in the classroom

F. Program Development
   1. Steps in Program Development
   2. Use of Special Keys
   3. Use of Various Statements, Functions, and Commands

CATALOG	NEW
COLOR =	NORMAL
DELETE	ON. . . .GOTO
END	ON. . . .GOSUB
FLASH	PLOT
FOR and NEXT	PRINT
GET	READ and DATA
GOSUB. . . .RETURN	REM
GOTO	RESTORE
GR	RETURN
HLIN	RND
HOME	RUN
HTAB	SAVE
IF, , , .THEN	SPEED
INPUT	SQR
INT	STEP
INVERSE	TAB
LET	TEXT
LIST	UNLOCK
LOAD	VLIN
LOCK	VTAB
	ZZ $

   Other commands useful in program development
   Relation symbols and rules
   Scientific notation
   Looping
   Nested looping
   Pausing with looping
   Counters
   4. Error Messages
   5. Operating the Printer
   6. Flowcharting

G. Evaluation of Microcomputers and Peripherals
   1. General Rules
      a. Availability of local maintenance
      b. Availability of local user to share programs and problems
      c. Cost versus use of peripherals
   2. Microcomputers
      a. Price
      b. Memory
      c. Tape recorder
      d. Disk drive
      e. Video display
      f. TV connection
      g. Game cartridge
      h. Color graphics
      i. Portable
      j. Execution time
      k. Program loading speed
      l. Editing capability
      m. Graphics resolution
      n. Screen size
      o. Colors available
      p. Keyboard
         (1) Layout
         (2) Size
         (3) Number of keys
      q. User-definable graphics
   3. Peripherals
      a. Printers
      b. Graphics Tablet
      c. Voice Simulator
   4. Published Evaluations

H. Software Selection
   1. Cost of Software Versus Cost of Teacher Written Programs
   2. Cost of Software Over the Years Versus Cost of Hardware
   3. Availability in Various Subject Areas
   4. Team Versus Individual Teacher Evaluation and Selection
   5. Review of Program with Correct Answer and Incorrect Answer Response
   6. Provision for Replacement or for Copying for a Back-up.
   7. Criteria from NCTM

I. Resources for Instructional Computing
   1. Projects
      a. Northwest Regional Educational Laboratory (Micro SIFT): NSF-clearinghouse for software
      b. Minnesota Educational Computing Consortium (MECC): statewide project which markets software
      c. TABS Project: develops, collects, and disseminates math computer materials
   2. Organizations
      a. Association for Computers in Mathematics and Science Teaching (ACMST)
      b. Association for Computing Machinery (ACM)
      c. Association for Educational Data Systems (AEDS)
      d. Association for Educational Communications and Technology (AECT)
      e. Association for the Development of Computer-Based Instructional Systems (ADCIS)
      f. International Council for Computers in Education (ICCE)
      g. Library and Information Technology Association (LITA)

3. Publications
   a. Apple Education News
   b. Apple Educators Newsletter
   c. #Byte
   d. Classroom Computer News
   e. *The Computing Teacher
   f. Cload
   g. Compute
   h. Computer-Using Educators
   i. *Creative Computing
   j. Educational Computer Magazine
   k. #80 Microcomputing
   l. Electronic Education
   m. *Educational Technology
   n. Electronic Learning
   o. #Interface Age
   p. Journal of Educational Technology Systems
   q. Kilobaud Microcomputing
   r. #Microcomputing
   s. Personal Computing
   t. Popular Computing
   u. #Popular Electronics
   v. Recreational Computing
   w. T.H.E. Journal

   * Bierce Library # Auburn Science Library

J. Relevant Research
   1. Learning
   2. Teaching
   3. Curriculum
   4. Evaluation

K. Problems with Computer-assisted Instruction
   1. Computer anxiety
   2. Lack of female participation

L. Careers with Computers
   1. Keypunch Operators
   2. Computer Operator
   3. Computer Salesman
   4. Computer Programmer
   5. Systems Analyst
   6. Computer Scientist
   7. Computer Technician
   8. Business, Government and Industry
   9. Education

M. Impact of Computers
   1. Social
   2. Economic
   3. Legal
      a. Privacy
      b. Security
   4. Home

N. Future of Electronic Technology
   1. Computer videodiscs Programs for Reading and Writing
   2. Combination of Microcomputer and Videodisc (with video and audio)
   3. Computerized Secondary Classroom of the Future
   4. Computerized Home of the Future
   5. Artificial Intelligence
   6. Robotics

FOR THE LISTING OF TEXTBOOKS AND BIBLIOGRAPHY SEE THE COURSE OUTLINE FOR MINICOMPUTER APPLICATIONS IN THE SECONDARY CLASSROOMS ON PAGES 30-36 IN SECTION II UNDERGRADUATE AND GRADUATE COURSE PRESENTATIONS AND EVALUATIONS.

COURSE TITLE: ADVANCED MICROCOMPUTER APPLICATIONS IN THE SECONDARY SCHOOLS

COURSE NUMBER: 5300:7
5300:4

CREDIT HOURS: Three semester hours (30 clinical hours)

CATALOGUE DESCRIPTION: Prerequisites: A knowledge of BASIC programming is required. Provides an in depth review of applications of word processor, color, graphics, and printer in BASIC programs appropriate for secondary schools. Contrasts Pascal with BASIC.

I. RATIONALE

This course prepares teachers to evaluate hardware and software, write programs in BASIC with color and graphics, discuss the potential, limitations and problems of computers, and develop curriculum applications of the microcomputer in subject area and computer literacy courses. Research data on the effectiveness of computer-assisted instruction in the secondary schools will be utilized in planning effective applications.

II. GENERAL OBJECTIVES

The student will

A. achieve computer literacy as required by a master teacher in today's secondary school

B. understand the potential, limitations, and problems of microcomputers in the secondary schools

C. demonstrate competency in writing programs in BASIC with color and graphics appropriate for a secondary subject area

D. plan curriculum for a computer literacy course

E. appreciate the career opportunities in computer technology and the future of electronic technology

F. evaluate hardware and software to facilitate good decision-making prior to acquisition.

SPECIFIC OBJECTIVES

A. Knowledge

By the end of the course, the student will be able to:

1. identify and describe procedures, statements, functions, and commands in writing programs in BASIC which involve color, low and high resolution, graphics, plotting multiple figures, and horizontal and vertical bar graphs.

2. discuss computer literacy in the secondary schools as applied to courses in the various subject areas and to courses in computer awareness and computer science.

3. identify and describe the development, limitations, potential, security, care, and housing of the microcomputer for secondary school use.

4. describe evaluative criteria useful in decision-making in the selection of a microcomputer, peripherals, and software for secondary school use.

5. discuss salient research findings about the achievement levels, retention, attitudes toward learning, etc., with computer-assisted instruction at the secondary level.

6. cite careers in computer technology.

7. discuss the social, economic, and legal impact of computers as well as the projected futures of electronic technology.

8. discuss the state of microcomputer use in the various secondary subject areas

B. Skills

By the end of the course, the student will be able to:

1. analyze a program written in BASIC appropriate for a secondary school and identify the instructional mode, strategy, and use of BASIC statements, functions, and commands.

2. develop three different programs in BASIC appropriate for the secondary classroom with the use of color and graphics in one program.

Skills, Continued

3. assess a commercially available program appropriate for secondary classroom use.

4. assess microcomputers and peripherals for secondary classroom use.

5. demonstrate the use of the Apple Writer and Sens Speller.

6. assess the state of microcomputer use in your certification area by reviewing an article which describes either a specific program, the effective use of a specific program, or the potential for microcomputer use in a subject area.

C. Attitudes and Values

By the end of the course, the student will be able to:

1. display an enjoyment in using microcomputer programs in the secondary schools

2. be sensitive to the moral and value problems posed by massive computer dependency.

III COURSE OUTLINE

A. Computer Literacy
   1. Controversy over the interpretation of computer literacy
   2. Interpretation of computer literacy
      a. Knowledge of what a computer is
      b. Knowledge of how computers are used
      c. Knowledge of the limitations of computer programs
      d. Knowledge of the social, economic, psychological, and legal impact of the computer in society
      e. Knowledge about programming languages
      f. Knowledge of programming in a language

B. History of the Computer
   1. Abacus 3000 BC
   2 Blaise Pascal 1642
   3. Jacquard 1800
   4. Babbage 1822 ("Father of Computers")
   5. Hollerith 1890
   6. Automatic Sequence Controlled Calculator (MARK 1) - first general purpose computer 1944
   7. Electronic Numerical Integrator and Calculator (ENIAC) - first electronics digital computer 1946
   8. Second Generation (Transistors) 1958-63
   9. Third Generation (Integrated Circuits) 1964-70
   10. Fourth Generation (Microchip) 1970

C. Microcomputer Operation
   1. Component Parts
      a. Byte
      b. Cathode Ray Tube (CRT)
      c. Central Processing Unit (CPU)
      d. Controller Card
      e. Disk Drive
      f. Diskettes or Disks
      g. Display Screen
      h. Floppy Disks
      i. Hardware
      j. Integrated Circuits (Chips)
      k. Memory
      l. Peripherals
      m. Power Lamp
      n. Power Supply
      o. Random - Access Memory (RAM)
      p. Software
      q. Terminal
      r. TV Monitor Connection

   2. Operation of the System
      a. Disk Operating System (DOS)
      b. Booting DOS Version
      c. Use of System Master Diskette
      d. Initializing a disk

3. Care of the Microcomputer System
   a. Diskettes
   b. Terminal
   c. Disk Drive
   d. Printer

D. Computer Languages - Advantages and Limitations in Applications in the Secondary Schools
   1. Beginners All-Purpose Symbolic Instruction Code (BASIC) - general purpose education
   2. Common Business Oriented Language (COBOL) - business
   3. Formula Translator (FORTRAN)
   4. LOGO (for children)
   5. PASCAL

E. Use of Microcomputers in Secondary Schools
   1. Instruction
      a. Writing with aid of word processor
      b. Secondary subject areas
      c. Special Education - Individualized Education Plan
      d. Vocational education
      e. Teacher record keeping
      f. Test administration and scoring
      g. Readability formulas

   2. Secondary Administration Uses
      Automobile parking permits
      Career guidance information and matching
      Compilation and analysis of basic competency records
      Compilation of honor roll and rank in class tabulations
      Curriculum development via "electronic cutting and pasting"
      Field Trips
      Grade reporting and distributions
      Instructional management
      Library circulation, records, and reports
      Management of an equipment inventory
      Management of business/personal records
      Management of mailing lists and labels
      Management of petty cash
      Management of school calendar
      Management of student activity records
      Management of student deficiency reports
      Management of student process reports and permanent records
      Management of textbook inventories
      Preparation of Individualized Education Plans (IEP'S)
      Property management
      Readability formulas
      Record management
      Scheduling of committee meetings
      Scheduling/Timetabling
      School attendance
      School and district financial management
      Text editing/word processing of letters and documents

3. Housing
   a. Security
   b. Distribution
      (1) One class - one microcomputer
      (2) Rotating use of one microcomputer
      (3) Laboratory facility
         (a) Directed individual activity
         (b) Free access

4. Program Types
   a. Computer managed instruction
   b. Drill and practice
   c. Tutorial
   d. Simulations
   e. Instructional games
   f. Problem solving
   g. Evaluation and test item banking
   h. Record keeping and processing
      (1) Test scores
      (2) Homework credit
      (3) Project credit
      (4) Laboratory credit
      (5) Accumulative scores
   i. Programs for the exceptional student

5. Advantages of Microcomputers in Secondary Schools
   a. Relevant education
   b. Increased motivation
   c. Immediate feedback
   d. Individualized instruction
   e. Releasing teachers from drill work
   f. With word processor, the improvement of writing skills
   g. Simulations impossible to duplicate in the classroom

6. Added cost of instruction per student

7. Developing a computer literacy course

F. Program Development
   1. Steps in Program Development
   2. Use of Special Keys
   3. Use of various statements, Functions and Commands

ABS	GOTO
CATALOG	GR
COLOR	HCOLOR
DELETE	HGR
DIM	HLIN
END	HOME
FLASH	HPLOT
FOR and NEXT	HTAB
GET	IF. . . .THEN
GOSUB. . .RETURN	INPUT

INT
INVERSE
LEFT$
LEN
LET
LIST
LOAD
LOCK
MID$
NEW
NORMAL
ON. . . .GOTO
ON. . . .GOSUB
PEEK
PLOT
POKE
PRINT
READ and DATA
REM
RESTORE
RETURN
RIGHT$
RND
ROT
RUN
SAVE
SCALE
SPEED
SQR
STEP
STR$
TAB
TEXT
UNLOCK
VAL
VLIN
VTAB
XDRAW
ZZ$

Counters
Horizontal and vertical bar graphs
Looping
Nested looping
Nested For. . . .Next Loops
Pausing with looping
Plotting high resolution graphic figures
Plotting multiple figures
Relation symbols and rules
Scientific notation
Other statements, functions, and commands useful in program development

4. Error Messages

5. Operating the Printer

6. Flowcharting

G. Evaluation of Microcomputers and Peripherals
   1. General Rules
      a. Availability of local maintenance
      b. Availability of local user to share programs and problems
      c. Cost versus use of peripherals
   2. Microcomputers
      a. Price
      b. Memory
      c. Tape recorder
      d. Disk drive
      e. Video display

f. TV connection
g. Game cartridge
h. Color graphics
i. Portable
j. Execution time
k. Program loading speed
l. Editing capability
m. Graphics resolution
n. Screen size
o. Colors available
p. Keyboard
   (1) Layout
   (2) Size
   (3) Number of keys
q. User-definable graphics

3. Peripherals
   a. Printers
   b. Graphics Tablet
   c. Voice Simulator

4. Published Evaluations

H. Software Selection
1. Cost of Software Versus Cost of Teacher Written Programs
2. Cost of Software Over the Years Versus Cost of Hardware
3. Availability in Various Subject Areas
4. Team Versus Individual Teacher Evaluation and Selection
5. Review of Program with Correct Answer and Incorrect Answer Response
6. Provision for Replacement or for Copying for a Back-up
7. Criteria from NCTM

I. Resources for Instructional Computing
1. Projects
   a. Northwest Regional Educational Laboratory (Micro SIFT): NSF-clearinghouse for software
   b. Minnesota Educational Computing Consortium (MECC): statewide project which markets software
   c. TABS Project: develops, collects, and disseminates math computer materials
2. Organizations
   a. Association for Computers in Mathematics and Science Teaching (ACMST)
   b. Association for Computing Machinery (ACM)
   c. Association for Educational Data Systems (AEDS)
   d. Association for Educational Communications and Technology (AECT)
   e. Association for the Development of Computer-Based Instructional Systems (ADCIS)
   f. International Council for Computers in Education (ICCE)
   g. Library and Information Technology Association (LITA)

3. Publications
   a. Apple Education News
   b. Apple Educators Newsletter
   c. #Byte
   d. Classroom Computer News
   e. *The Computing Teacher
   f. Cloud
   g. Compute
   h. Computer-Using Educators
   i. *Creative Computing
   j. Educational Computer Magazine
   k. #80 Microcomputing
   l. Electronic Education
   m. *Educational Technology
   n. Electronic Learning
   o. #Interface Age
   p. Journal of Educational Technology Systems
   q. Kilobaud Microcomputing
   r. #Microcomputing
   s. Personal Computing
   t. Populat Computing
   u. #Popular Electronics
   v. Recreational Computing
   w. T.H.E. Journal

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J. Relevant Research
   1. Learning
   2. Teaching
   3. Curriculum
   4. Evaluation

K. Problems with Computer-assisted Instruction
   1. Computer anxiety
   2. Lack of female participation

L. Careers with Computers
   1. Keypunch Operators
   2. Computer Operator
   3. Computer Salesman
   4. Computer Programmer
   5. Systems Analyst
   6. Computer Scientist
   7. Computer Technician
   8. Business, Government and Industry
   9. Education
   10. Medicine
   11. Creative Arts
   12. Weather predictions

M. Impact of Computers
   1. Social
   2. Economic
   3. Psychological
   4. Legal
      a. Privacy
      b. Security
   5. Home

N. Future of Electronic Technology
   1. Computer videodiscs Programs for Reading and Writing
   2. Combination of Microcomputer and Videodisc (with video and audio)
   3. Computerized Secondary Classroom of the Future
   4. Computerized Home of the Future
   5. Robotics
   6. Artificial Intelligence

Reference Texts:

Minnesota Educational Computing Consortium. Intermediate Applesoft™ Basic (Preliminary Version for Use With the Apple™ Microcomputer) St. Paul, Minnesota: Minnesota Educational Computing Consortium, 1981.

Haskell, Richard. Apple Basic Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1982.

Text:

Lindbeck, Joy S. Vocabulary Development Programs in Secondary Subject Areas Program for Apple II Microcomputer. The University of Akron, 1982.

Lindbeck, Joy S. Record of Attendance Program for Apple II Microcomputer. Programmer: David Gingo. The University of Akron, 1981.

Lindbeck, Joy S. Grade Book Program for Apple II Microcomputer. Programmer: David Gingo. The University of Akron, 1981.

Commercial Programs on Disks

*Business	Volume 1	MECC Publication
*Mathematics	Volume 3 (Geometry)	MECC Publication
*Science	Volume 2 (High School)	MECC Publication
*Social Studies	Volume 1	MECC Publication

MECC = Minnesota Educational Computing Consortium: St. Paul, Minnesota

* Available on the shelf of the Apple Cart

Math Sequences: Milliken
Computer-Based
Courseware for Grades
1 - 6

FOR THE LISTING OF THE BIBLIOGRAPHY SEE THE COURSE OUTLINE FOR MINICOMPUTER APPLICATIONS IN THE SECONDARY CLASSROOMS ON PAGES 31-36 IM SECTION II UNDERGRADUATE AND GRADUATE COURSE PRESENTATIONS AND EVALUATIONS.